X-C13SG User manual

Based on RISC-V SOC

Support Wi-Fi (802.11b/g/n) and BLE5.0 Wireless Standards

1 Module Overview

1.1 Features

MCU

- TG7100C embedded,32-bit RISC-V single-core

  processor

- 160 MHz CPU

- 276 KB RAM

- 128 KB ROM

- 1 Kb eFuse

Wi-Fi

- IEEE 802.11 b/g/n-compliant

- Operation Frequency：

  2412-2462MHz（802.11b/g/n ht20）

- Supports 20 MHz bandwidth in 2.4 GHz band

- Transmit Power （Max 22dBm）

- Modulation method（DSSS、OFDM）

- Security Mechanisms（WEP/WPA-PSK/WPA2-

  PSK/WPA3-SAE）

- Encryption（WEP64/WEP128/TKIP/AES）

- Support Wi-Fi STA/AP Mode

- Support UART Data Communication with Wi-Fi

  or BLE

- Support APLink and BLELINK Config

- Support Wireless and Remote Firmware

  Upgrade Function

- Support Software SDK for Develop

- Support PCB

- Support PCB /IPEX Antenna Option

BLE

- Operation Frequency：
  2402-2480MHz

- Transmit Power （10.30 dBm(BLE)）

- Receiver Sensitivity （-97 dBm）

- Advertising extensions

Hardware

- Peripherals: GPIO、SPI、UART、ADC、

  DAC、IR、LED、PWM

- Support XTAL 24/32/38.4/40MHz

- 2MB SPI flash

- Operating voltage/Power supply：2.7～3.6 V

- Operating ambient temperature:

  Operating Temp: -40～85°C

  Storage Temp: -40～105 °C

  Humidity/MSL: <85% / Level 3

- Operating Current:

  Peak (1ms for every 100ms): <350mA

  Average (STA, No data): 45mA

  Average (STA, Continuous TX): 60mA

  Average (AP): 70mA

  Standby: 310uA(Reset Pin set to low)

- Size：Figure 3

1.2 Description

X-C13SG is a fully self-contained small form-factor, single stream, 802.11b/g/n Wi-Fi and BLE baseband/MAC designs, which provide a wireless interface to any equipment with a serial or other interface for data transfer.

X-C13SG integrate MAC, base band processor, RF transceiver in hardware and all Wi-Fi protocol and configuration functionality and networking stack, embedded firmware to make a fully self-contained solution for a variety of applications.

1.3 Applications

- Light control
- Smart plug
- Industrial control
- Industrial sensors and controls

- Health Care
- Consumer Electronics
- Smart Agriculture
- Retail and Catering

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2 Hardware Introduction

2.1 Pin Layout

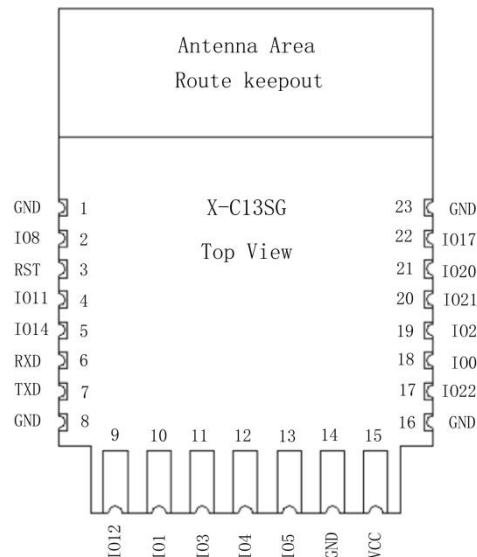- X-C13SG comes with a on-board PCB antenna, please refer to Figure 2.

Figure 2.   X-C13SG Pin Layout (Top View)

2.2 Pin Description

The module has 23 pins. See pin definitions in Table 1.

Pin	Describtion	Type	Function
1,8,14,16,23	Ground	P	GND
2	GPIO8	IPD	Internal 10K pull-down resistor, Boot select: Low: boot from module flash. High: boot from external UART. This is used for factory firmware program, leave it unconnected for user application
3	RESET	I,PU	"Low" effective reset input.
4	UART1_RX GPIO11	I	3.3V TTL UART1 Debug Input SPI, PWM
5	GPIO14	IPU/O	SPI, DAC, ADC
6	UART0_RX GPIO7	I	3.3V TTL UART0 Communication Input
7	UART0_TX GPIO16	O,PU	3.3V TTL UART0 Communication Output
9	GPIO12	I/O	SPI, PWM. ADC
10	GPIO1	IPU/O	SPI,PWM

11	GPIO3 Factory	IPU	press this button ("Low" > 4s) and loose to make the module recover to factory setting.
12	GPIO4 Ready	O	"0" – Boot-up OK; "1" – Boot-up Fail;
13	GPIO5 Link	IPU/O	"0" – Wi-Fi connect to router "1" – Wi-Fi unconncted;
15	+3.3V	P	The maximum output current of the external power supply is recommended to be above 500mA.
17	GPIO22	IPU/O	SPI,PWM
18	GPIO0	IPU/O	SPI,PWM
19	GPIO2	I/O	SPI,PWM
20	GPIO21	IPU/O	SPI,PWM
21	GPIO20	IPU/O	SPI,PWM
22	UART1_TX GPIO17	O	3.3V TTL UART1 Debug Output

Table1.   Pins Definition

2.3 Physical Dimensions

- X-C13SG Physical Dimensions (Unit: mm),please refer to Figure 4:
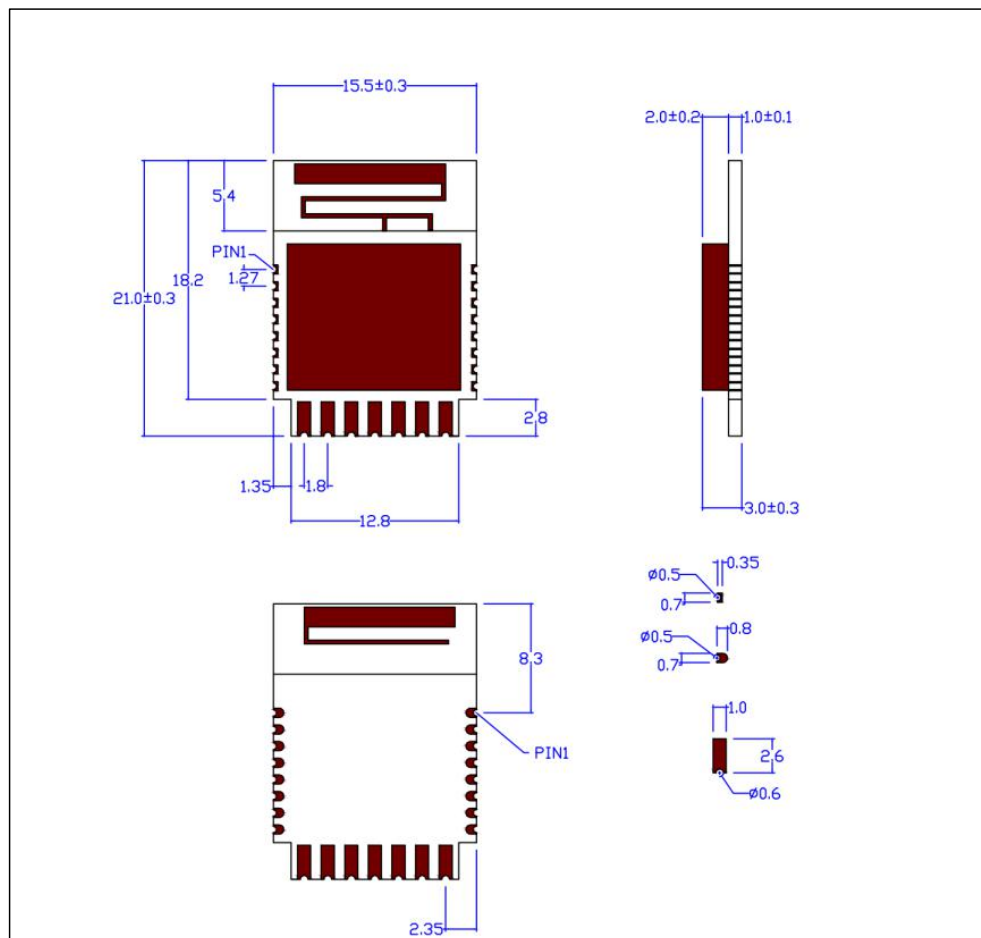

Figure 3.   X-C13SG Physical Dimensions

2.4 PCB Antenna

X-C13SG support internal PCB antenna option. When customer select internal antenna, you shall comply with following antenna design rules and module location suggestions:

● For customer PCB, module antenna area can't put componet or paste GND net;(See the following red arrow area)

● Antenna must away from metal or high components at least 20mm;

● Antenna can't be shieldedby any meal enclosure; All cover, include plastic, shall away from antenna at least 20mm;

suggest module better locate in following region at customer board, which to reduce the effect to antenna and wireless signal, and better consult ChipFresh technical people when you structure your module placement and PCB layout.
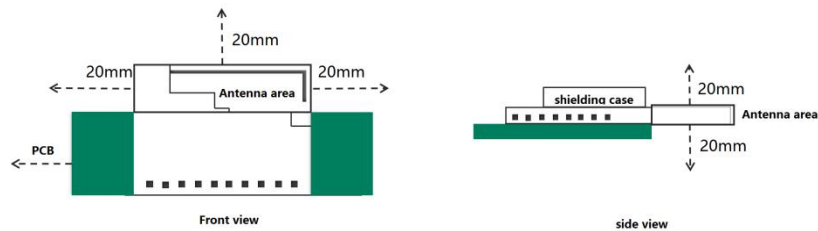

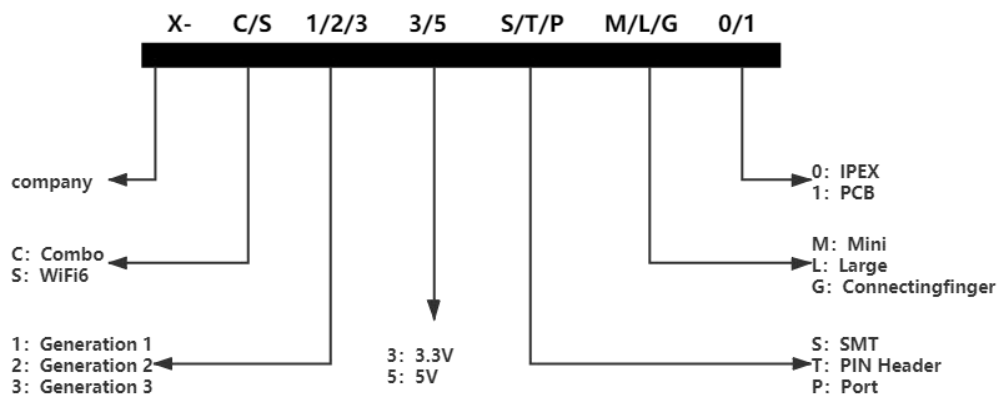Figure 4.   Suggested Module Placement Region

2.5 Ordering Information

Figure 5.   Ordering Information

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Power supply voltage	VDD	-0.3	3.6	V
I/O PIN	-	-0.3	VDD+0.3	V
Storage temperature	-	-40	125	℃

Table2.　　Absolute Maximum Ratings

3.2 Recommended Operating Conditions

Parameter	Symbol	Min	Type	Max	Unit
Power supply voltage	VDD	2.1	3.3	3.6	V
Operating ambient temperature	-	-40	-	85	℃

Table3.　　Recommended Operating Conditions

3.3 ESD

Name	Description	Typ	Unit
ESD-HBM	Human body model class 2	+/- 2000	V
ESD-MM	Moisture sensitivity level	2	-
ESD-CDM	Charge device model	+/-500	V

Table4.　　ESD

3.4 WiFi/BLE RF Standards

Class	Item	Parameters	Typ
Wi-Fi	Wireless standard	802.11 b/g/n	-
	Frequency range	2412MHz-2462MHz	-
	Maximum Peak Output Power (Conducted):	802.11b/g/n	21.51 dBm
BLE	Wireless standard	Bluetooth 5	-
	Frequency range	2402MHz-2480MHz	-
	Maximum Peak Output Power (Conducted):	-	10.30 dBm

4 Product Handling

4. 1 Reflow Profile

Solder the module in a single reflow.

Figure 7.   Reflow Profile
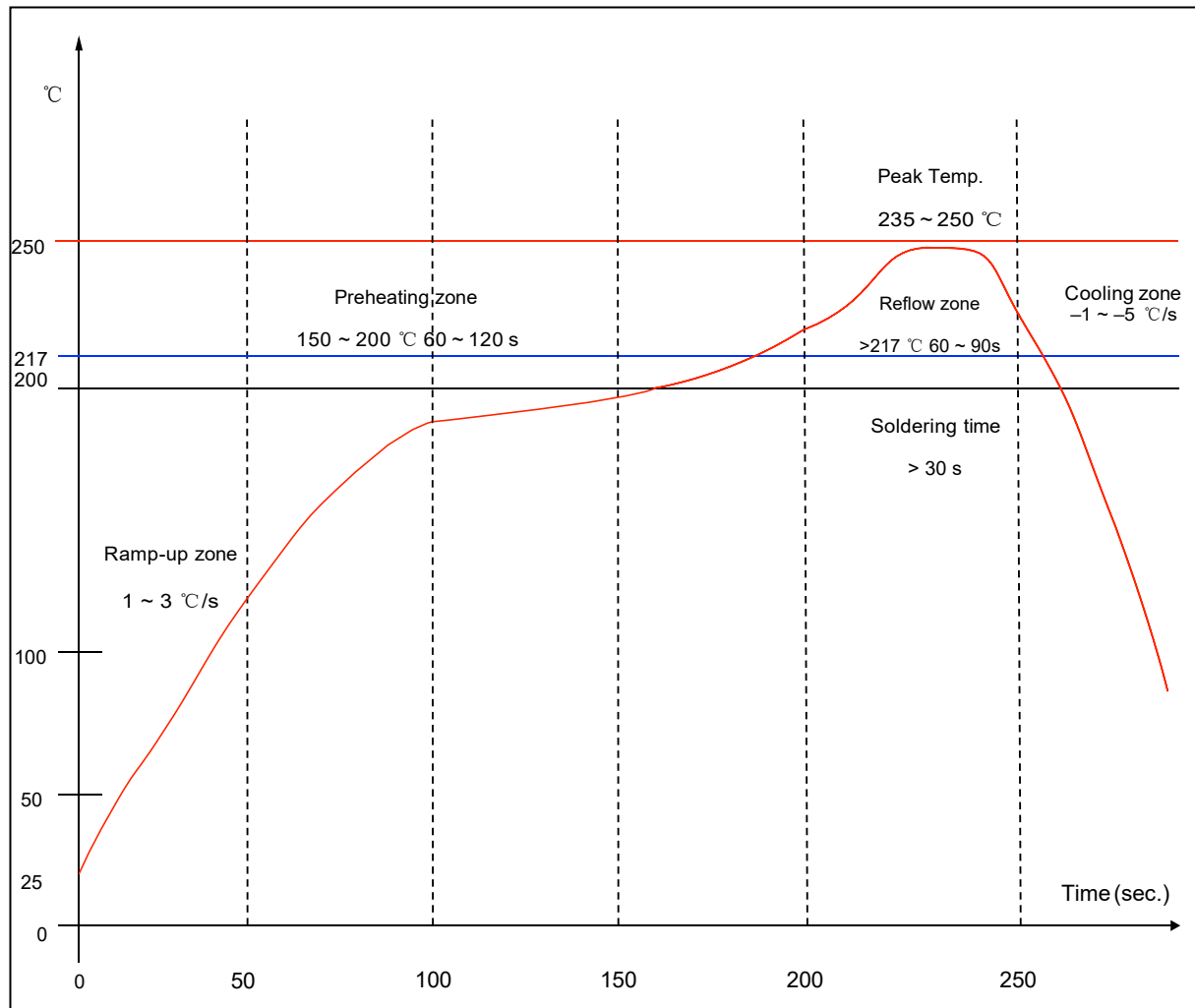
Ramp-up zone — Temp.: 25 ~ 150 ℃ Time: 60 ~ 90 s Ramp-up rate: 1 ~ 3 ℃/s

Preheating zone — Temp.: 150 ~ 200 ℃ Time: 60 ~ 120 s

Reflow zone — Temp.: >217 ℃ 7LPH: 60 ~ 90 s; Peak Temp.: 235 ~ 250 ℃ Time: 30 ~ 70 s

Cooling zone — Peak Temp. ~ 180 ℃ Ramp-down rate: –1 ~ –5 ℃/s

Solder — Sn-Ag-Cu (SAC305) lead-free solder alloy

5.2 Storage Conditions

- Shelf life in sealed bag: 12 months, at <30℃ and <60% relative humidity (RH).
- Recommend to store at ≦10% RH with vacuum packing.
- The module is rated at the moisture sensitivity level (MSL) of 3.

5.3 Device Handling Instruction (Module IC SMT Preparation)

- Baked required with 24 hours at 125+-5℃ before rework process.
- After bag is opened, devices that will be re-baked required after last baked with window time 168 hours.
- Recommend to oven bake with N2 supplied
- Recommend end to reflow oven with N2 supplied
- If SMT process needs twice reflow:

  (1) Top side SMT and reflow (2) Bottom side SMT and reflow

  Case 1: Wifi module mounted on top side. Need to bake when bottom side process over 168 hours window time, no need to bake within 168 hours

  Case 2: Wifi module mounted on bottom side, follow normal bake rule before process

  Note: Window time means from last bake end to next reflow start that has 168 hours space.

7 Contact Information

Address: Room 1315, #2 Building, No.268 Zhouzhu Road, Pudong District,

Shanghai,China

Web: www.chipfresh.com

Sales Contact: sales@chipfresh.com

<END>

FCC Statement：

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference,and (2) this device must accept any interference received, including interference that may cause undesired operation.

OEM Guidance

1. Applicable FCC rules

   This module is granted by Single Modular Approval. It complies to the

   requirements of FCC part 15C, section 15.247 rules.

2. The specific operational use conditions

   This module can be used in IoT devices. The input voltage to the module is nominally 2.7 ~ 3.6 V

   DC. The operational ambient temperature of the module is -40 to 85 degree C. Only the embedded

   PCB antenna is allowed. Any other external antenna is prohibited.

 3.Limited module procedures

   N/A

4.Trace antenna design

   N/A

 5.RF exposure considerations

   The equipment complies with FCC radiation exposure limits set forth for an uncontrolled
   environment. This equipment can operated with minimum distance 20cm between the radiator
   and your body.

6. Antenna

Antenna type :PCB Antenna; Antenna Max. Peak Gain 2 dBi

7. Label and compliance information

An exterior label on OEM's end product can use wording such
as the following: "Contains FCC ID:2A3M5-X-C13SG "

8. Information on test modes and additional testing requirements

a)The modular transmitter has been fully tested by the module grantee on the required
number of channels,modulation types, and modes, it should not be necessary for the host
installer to re-test all the available transmitter modes or settings. It is recommended that the
host product manufacturer, installing the modular transmitter,perform some investigative
measurements to confirm that the resulting composite system does not exceed the spurious
emissions limits or band edge limits (e.g., where a different antenna may be causing
additional emissions).
b)The testing should check for emissions that may occur due to the intermixing of emissions
with the other transmitters, digital circuitry, or due to physical properties of the host product
(enclosure). This investigation is especially important when integrating multiple modular
transmitters where the certification is based on testing each of them in a stand-alone
configuration. It is important to note that host product manufacturers should not assume that
because the modular transmitter is certified that they do not have any responsibility for final
product compliance.
c)If the investigation indicates a compliance concern the host product manufacturer is
obligated to mitigate the issue. Host products using a modular transmitter are subject to all
the applicable individual technical rules as well as to the general conditions of operation in
Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product
will be obligated to stop operating the device until the interference have been corrected .